

# Biomechanics of Human Motion

APK6226C | Class # 10630 | 3 Credits | Fall 2022

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## Course Info

### INSTRUCTOR

**Matt Terza Ph.D.**

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Office Phone: 352-294-1716

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Preferred Method of Contact: email directly at [mjt023@ufl.edu](mailto:mjt023@ufl.edu)

### OFFICE HOURS

M | Period 5 (12:35 PM – 2:45 PM) or by appointment

### MEETING TIME/LOCATION

W | Periods 6-8 (12:50 PM – 3:50 PM)

Primarily Classroom/Traditional – Room: FLG 0235

2/15/2022 @ 12:30 PM - 2:30 PM

## COURSE DESCRIPTION

Applying the principles of statics, kinematics, and kinetics to kinesiological systems of the human body in movement, activities of daily living, and sports skills.

## PREREQUISITE KNOWLEDGE AND SKILLS

PET 2320C; MGF 1202 or MAC 1142.

## REQUIRED AND RECOMMENDED MATERIALS

### Required Textbook



Robertson, D. G. E., Caldwell, G. E., Hamill, J., Kamen, G., & Whittlesey, S. N. (2014). Research methods in biomechanics. ISBN-13: 978-0736093408 & ISBN-10: 0736093400

### Recommended Textbooks



Levangie, P. K., Norkin, C. C., & Levangie, P. K. (2011). *Joint structure and function: A comprehensive analysis*. Philadelphia: F.A. Davis Co. ISBN 9780803658783

**This text is not required but is the text that most underlies the joint modules of this course and is great resource for understanding the mechanical function of joints at a specific anatomical level**

Other Helpful Textbooks



Levine, D., Richards, J., Whittle, M., & Whittle, M. (2012). Whittle's gait analysis. Edinburgh: Churchill Livingstone Elsevier. ISBN-13: 978-0702042652 & ISBN-10: 070204265X

**This text is a great book for understanding gait and its abnormalities. Information from this book shows up in the Gait Kinematics module and is sprinkled throughout the kinetic modules.**

David A. Winter Biomechanics and Motor Control of Human Movement, Fourth Edition, 17 September John Wiley & Sons, Inc. 2009 Print ISBN:9780470398180 | Online ISBN:9780470549148

**Another text on technical methods in performing biomechanical data collections and analyses. David Winter is a notable author for his seminal work in biomechanical research methods.**

*Biomechanical Basis of Human Movement* by Hammil and Knutzen, ISBN 13: 9781451177305

*Basic Biomechanics of the Musculoskeletal System* Nordin, M. & Frankel, V.H. (2012). (4th Edition). Baltimore, Maryland. Lippincot Williams & Wilkins. ISBN-13: 978-1609133351

**Introductory Biomechanical Texts that are helpful in conceptualizing content with less dense math compared to the research methods text.**

### **COURSE FORMAT**

This class will meet in person weekly for lecture, labs, and seminar.

### **COURSE LEARNING OBJECTIVES:**

1. Collect, quantify, analyze, explain, interpret, and predict kinematic, kinetics and neuromuscular aspects of human motion during gait, exercise, and sports using a biomechanical approach.
2. Explain the of biomechanics of joint function especially with respect to gait and sport

## **Course & University Policies**

### **ATTENDANCE POLICY**

Attendance is expected and participation will be reflected in your course grade. Excused absences will be considered in accordance with the University of Florida's policies and guidelines.

### **PERSONAL CONDUCT POLICY**

Students are expected to exhibit behaviors that reflect highly upon themselves and our University. Outline for them exactly what that means in the context of your course.

UF students are bound by The Honor Pledge which states, "We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honor and integrity by abiding by the Honor Code. On all work submitted for credit by students at the University of Florida, the following pledge is either required or implied: "On my honor, I have neither given nor received unauthorized aid in doing this assignment." The Honor Code (<http://www.dso.ufl.edu/sccr/process/student-conduct-honor-code/>) specifies a number of behaviors that are in violation of this code and the possible sanctions.

Furthermore, you are obliged to report any condition that facilitates academic misconduct to appropriate personnel. If you have any questions or concerns, please consult the instructor or TA in this class.

### **EXAM MAKE-UP POLICY**

A student experiencing an illness should visit the UF Student Health Care Center or their preferred healthcare provider to seek medical advice and obtain documentation. If you have an illness, family emergency or death,

please contact the Dean of Students Office ([www.dso.ufl.edu](http://www.dso.ufl.edu)) and follow the DSO Care Team procedures for documentation and submission of a request for make-up assignment (<https://care.dso.ufl.edu/instructor-notifications/>). The DSO will contact the instructor. Do not provide any documentation to the instructor regarding illness or family emergency. This is your personal and protected information. The DSO is qualified to receive and verify the documents you provide. The instructor will follow the recommendations from the DSO.

Requirements for class attendance and make-up exams, assignments, and other work in this course are consistent with university policies that can be found in the online catalog at: <https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx>.

## ACCOMMODATING STUDENTS WITH DISABILITIES

Students with disabilities who experience learning barriers and would like to request academic accommodations should connect with the Disability Resource Center by visiting their Get Started page at <https://disability.ufl.edu/students/get-started/>. It is important for students to share their accommodation letter with their instructor and discuss their access needs, as early as possible in the semester.

## COURSE EVALUATIONS

Students are expected to provide professional and respectful feedback on the quality of instruction in this course by completing course evaluations online via GatorEvals. Guidance on how to give feedback in a professional and respectful manner is available at <https://gatorevals.aa.ufl.edu/students/>. Students will be notified when the evaluation period opens and can complete evaluations through the email they receive from GatorEvals, in their Canvas course menu under GatorEvals, or via <https://ufl.bluera.com/ufl/>. Summaries of course evaluation results are available to students at <https://gatorevals.aa.ufl.edu/public-results/>.

## Getting Help

### HEALTH & WELLNESS

- U Matter, We Care: If you or a friend is in distress, please contact [umatter@ufl.edu](mailto:umatter@ufl.edu) or 352 392-1575
- Counseling and Wellness Center: <https://counseling.ufl.edu/>, 352-392-1575
- Sexual Assault Recovery Services (SARS) - Student Health Care Center, 392-1161
- University Police Department, 392-1111 (or 9-1-1 for emergencies) <http://www.police.ufl.edu/>

### ACADEMIC RESOURCES

- E-learning technical support, 352-392-4357 (select option 2) or e-mail to [Learning-support@ufl.edu](mailto:Learning-support@ufl.edu). <https://lss.at.ufl.edu/help.shtml>
- Career Connections Center, Reitz Union, 392-1601. Career assistance and counseling. <https://career.ufl.edu/>
- Library Support, <http://cms.uflib.ufl.edu/ask>. Various ways to receive assistance with respect to using the libraries or finding resources.
- Teaching Center, Broward Hall, 392-2010 or 392-6420. General study skills and tutoring. <http://teachingcenter.ufl.edu/>
- Writing Studio, 302 Tigert Hall, 846-1138. Help brainstorming, formatting, and writing papers. <http://writing.ufl.edu/writing-studio/>
- Student Complaints On-Campus: <https://sccr.dso.ufl.edu/policies/student-honor-code-student-conduct-code/> On-Line Students Complaints: <http://distance.ufl.edu/student-complaint-process/>

## CLASS LEARNING ENVIRONMENT

It is important to me that you feel welcome and safe in this class; and that you are comfortable participating in class discussions and communicating with me on any issues related to the class. Please let me know if you are having a tough time in any capacity so that we can work together to generate a solution.

Together as a class we have a responsibility and opportunity to create a space that is inviting and respectful to every individual and create a learning environment that affords equal opportunity for all students to learn and succeed.

Additionally, if your preferred name is not the name listed on the official UF roll, please let me know as soon as possible by e-mail or otherwise. Please let me know how you would like to be addressed in class. You may also change your "Display Name" in Canvas. Canvas uses the "Display Name" as set in myUFL. The Display Name is what you want people to see in the UF Directory, such as "Ally" instead of "Allison." To update your display name, go to [one.ufl.edu](https://elearning.ufl.edu/student-help-faqs/), click on the dropdown at the top right, and select "Directory Profile." Click "Edit" on the right of the name panel, uncheck "Use my legal name" under "Display Name," update how you wish your name to be displayed, and click "Submit" at the bottom. This change may take up to 24 hours to appear in Canvas. This does not change your legal name for official UF records. <https://elearning.ufl.edu/student-help-faqs/>

## Grading

Grades will be based on a point system of 1000 total points coming from quizzes, exams, and assignments.

Once a grade is posted students have **two weeks** to dispute an error in grading.

Item	Qty.	Points Per	Category Points	Percent of Final Grade
Lecture Exams	3	140	420	42 %
Labs	3	40	120	12 %
Homework	12	30	360	36 %
Presentation & Discussion	1	100	100	10 %
<b>Course Total</b>	<b>N/A</b>	<b>N/A</b>	<b>1000</b>	<b>100 %</b>

**Lecture Exams (3)** – There will be three lecture exams throughout the semester which will not be overtly cumulative (although some concepts build on previous ones). These lecture exams will be available during the week they are assigned on the schedule. You can take them at the time that works best for your schedule, and they will be proctored via Honorlock. The allotted time for these exams will be 2 Hours. The exams will cover class content including both quantitative and conceptual content from recorded lectures and conceptual information from required readings. You will be provided the course formula sheet within the Canvas assessment for the exams. Do NOT print out or open your own from your desktop as this will flag your exam in Honorlock.

**Labs (3)** – This course includes 3 lab assignments which analysis of movement data and modeling of the Musculo skeletal system. Lab 1 will assess kinematics of 2D video recorded exercise movement data. Lab 2 will involve the modeling of the musculoskeletal system. Lab 3 will involve the kinematic and kinetic analysis of 3D motion capture data recorded via a Vicon motion capture system. These labs will partly be assessed by entry of your outcome into a Canvas quiz that will parallel the assignment deliverables.

**Module Quizzes (12)** – There will be 12 module quizzes which will be presented as Canvas quizzes. The constraints on the more quantitative quizzes will be more relaxed as to take on the quality of a graded homework rather than a high-pressure assessment. The quizzes will also draw from lecture, Muscle and Motion, and required reading content. These may have quantitative and qualitative components. These are meant to prompt deeper investigation of the content and help prepare you for the exams.

**Paper Presentations and Discussion and Participation (100)** – Each student will present a research article in an assigned topic area to the class. All students will be responsible for reading and discussing the paper during the seminar portion of the course. One student will be assigned to each presenter as their main discussant and will be responsible from prompting discussion by providing evocative questions related to the article. *Unexcused absences or poor participation in discussion will deduct -10 pts from this category regardless of whether or not you are the discussant.*

## GRADING SCALE

Grades will be based on a point system of 1000 total points coming from quizzes, exams, and assignments.

Once a grade is posted students have **two weeks** to dispute an error in grading.

More detailed information regarding current UF grading policies can be found here:

<https://catalog.ufl.edu/UGRD/academic-regulations/grades-grading-policies/>.

*Any requests for additional extra credit or special exceptions to these grading policies will be interpreted as an honor code violation (i.e., asking for preferential treatment) and will be handled accordingly.*

Letter Grade	Points Needed to Earn Each Letter Grade	Percent of Total Points Associated with Each Letter Grade	GPA Impact of Each Letter Grade
A	≥ 900	90.00-100%	4.0
A-			3.67
B+	870-899	87.00-89.99%	3.33
B	830-869.99	83.00-86.99%	3.0
B-	800-829.99	80.00- 82.99%	2.67
C+	770-799.99	77.00-79.99%	2.33
C	730-769.99	73.00-76.99%	2.0
C-	700-729.99	70.00-72.99%	1.67
D+	670-699.99	67.00-69.99%	1.33
D	600-679.99	60.00-66.99%	1.0
D-			0.67
E	≤ 599.99	0-59.99%	0

## Weekly Course Schedule

This syllabus and schedule are intended to give the student guidance in what may be covered during the semester and will be followed as closely as possible. However, the professor reserves the right to modify, supplement and make changes as the course needs arise. This includes exam dates and lecture topics that may change depending on class progress.

### WEEKLY SCHEDULE

Module	Week	Dates	Module
1.1	1	8/24/2021 - 8/26/2021	Getting Started Fundamental Concepts and Tools
1.2	2	8/29/2021 - 9/2/2021	Fundamental Concepts and Tools
2.1	3	9/5/2021 - 9/9/2021	Planar Kinematics
2.2	4	9/12/2021 - 9/16/2021	Planar Kinematics
3	5	9/19/2021 - 9/23/2021	Tissue Loading and Squatting Biomechanics <b>Lab 1: 2D Video Movement Analysis</b>
E1	6	9/26/2021 - 9/30/2021	<b>Exam 1 (M1-M3)</b>
4	7	10/3/2021 - 10/7/2021	Hip Complex Biomechanics
5	8	10/10/2021 - 10/14/2021	Knee Joint Biomechanics
5	9	10/17/2021 - 10/21/2021	Ankle and Foot Complex Biomechanics
6	10	10/24/2021 - 10/28/2021	Kinematics of Gait <b>Lab 2: Musculoskeletal modeling</b>
E2	11	10/31/2021 - 11/4/2021	<b>Exam 2 (M4-M7)</b>

7	12	11/7/2021 - 11/11/2021	Forces Impulse and Momentum
8	13	11/14/2021 - 11/18/2021	Inverse Dynamics
9	14	11/21/2021 - 11/25/2021	No class Thanksgiving Break (Wed - Friday)
10	15	11/28/2021 - 12/2/2021	Work, Energy and Power (continued) <b>Lab 3: 3D MoCap Analysis</b>
(11)	16	12/5/2021 - 12/9/2021	(Upper Extremity Joint Biomechanics)
E3	17	12/12/2021 - 12/16/2021	<b>Exam 3: 12/15/2022 @ 12:30 PM - 2:30 PM</b>

## SUCCESS AND STUDY TIPS

- Do the Homework and hone a solution process for types of problem
- Come to class prepared and don't fall behind
- Come to office hours when you have questions/challenges
- Generate study questions to test yourself on conceptual information without the information in front of you
- Review old quizzes and homework
- (Re)watch recorded lectures as needed

## PRIVACY

Our class sessions may be audio visually recorded for students in the class to refer back and for enrolled students who are unable to attend live. Students who participate with their camera engaged or utilize a profile image are agreeing to have their video or image recorded. If you are unwilling to consent to have your profile or video image recorded, be sure to keep your camera off and do not use a profile image. Likewise, students who un-mute during class and participate orally are agreeing to have their voices recorded. If you are not willing to consent to have your voice recorded during class, you will need to keep your mute button activated and communicate exclusively using the "chat" feature, which allows students to type questions and comments live. The chat will not be recorded or shared. As in all courses, unauthorized sharing of recorded materials is prohibited.

## RECORDINGS OF CLASS

Students are allowed to record video or audio of class lectures. However, the purposes for which these

recordings may be used are strictly controlled. The only allowable purposes are (1) for personal educational use, (2) in connection with a complaint to the university, or (3) as evidence in, or in preparation for, a criminal or civil proceeding. All other purposes are prohibited. Specifically, students may not publish recorded lectures without the written consent of the instructor.

A “class lecture” is an educational presentation intended to inform or teach enrolled students about a particular subject, including any instructor-led discussions that form part of the presentation, and delivered by any instructor hired or appointed by the University, or by a guest instructor, as part of a University of Florida course. A class lecture does not include lab sessions, student presentations, clinical presentations such as patient history, academic exercises involving solely student participation, assessments (quizzes, tests, exams), field trips, private conversations between students in the class or between a student and the faculty or lecturer during a class session.

Publication without permission of the instructor is prohibited. To “publish” means to share, transmit, circulate, distribute, or provide access to a recording, regardless of format or medium, to another person (or persons), including but not limited to another student within the same class section. Additionally, a recording, or transcript of a recording, is considered published if it is posted on or uploaded to, in whole or in part, any media platform, including but not limited to social media, book, magazine, newspaper, leaflet, or third party note/tutoring services. A student who publishes a recording without written consent may be subject to a civil cause of action instituted by a person injured by the publication and/or discipline under UF Regulation 4.040 Student Honor Code and Student Conduct Code.